

What is claimed is:

1        1. A storage device comprising:  
2              a probe; and  
3              a storage medium having a plurality of storage cells,  
4              the probe to form a trench in regions of the storage medium corresponding to  
5              at least two of the storage cells,  
6              wherein the at least two storage cells contain corresponding portions of the  
7              trench to store corresponding data bits.

1        2. The storage device of claim 2, wherein the storage medium comprises a  
2              storage surface,  
3              wherein a storage cell containing a transition between the storage surface and  
4              the trench contains a data bit having a first state, and  
5              wherein a storage cell containing either a portion of the trench or a portion of  
6              the storage surface but not containing a transition between the storage surface and the trench  
7              contains a data bit having a second state.

1        3. A storage device comprising:  
2              a storage medium having a plurality of storage cells; and  
3              a probe to read from and write to the storage cells,  
4              wherein the storage medium includes a first structure and second structure,  
5              wherein a first storage cell containing a transition between the first structure  
6              and the second structure contains a data bit having a first state, and  
7              wherein a second storage cell not including a transition between the first  
8              structure and the second structure contains a data bit having a second state.

1        4. The storage device of claim 3, wherein the first structure comprises a trench,  
2              and the second structure comprises a surface of the storage medium.

1           5.     The storage device of claim 1, wherein the first structure has a different  
2 physical characteristic than the second structure.

1           6.     The storage device of claim 1, wherein the first structure has a different  
2 chemical characteristic than the second structure.

1           7.     The storage device of claim 1, wherein the first structure has a different  
2 electronic characteristic than the second structure.

1           8.     The storage device of claim 1, wherein the probe comprises a nanotechnology  
2 probe.

1           9.     A system comprising:  
2                 a processor; and  
3                 a storage device coupled to the processor, the storage device comprising:  
4                     a probe;  
5                     a storage medium having a storage surface,  
6                     the probe to form a trench in the storage medium,  
7                     wherein a transition between the trench and the storage surface  
8             represents a first storage state, and wherein lack of a transition between the trench and the  
9             storage surface represents a second different storage state.

1           10.    The system of claim 9, wherein the storage medium includes storage cells, a  
2 first storage cell being located in a first region containing a first end of the trench, and a  
3 second storage cell is located in a second region containing a second end of the trench, each  
4 of the first and second ends constituting a transition.

1           11.    The system of claim 10, wherein a third storage cell is located in a third region  
2 containing a portion of the trench, and a fourth storage cell is located in a fourth region  
3 containing a portion of the storage surface of the storage medium away from the trench.

1           12. The system of claim 11, wherein each of the first and second storage cells  
2 stores a respective data bit having the first storage state, and each of the third and fourth  
3 storage cells stores a respective data bit having the second storage state.

1           13. The system of claim 9, further comprising read circuitry to detect engagement  
2 of the probe with a transition between the trench and the storage surface.

1           14. The system of claim 13, wherein the probe has a tip, the probe tip and the  
2 storage medium moveable with respect to each other to enable the probe tip to engage the  
3 storage surface, the trench, and any transition between the trench and the storage surface.

1           15. The system of claim 14, wherein the probe tip is adapted to form the trench  
2 during a write operation.

1           16. The system of claim 15, wherein the probe tip is adapted to form a second  
2 trench in the storage medium during the write operation, a transition between the second  
3 trench and the storage surface to represent the first storage state.

1           17. The system of claim 16, further comprising:  
2                 an encoder to encode input data to produce encoded data; and  
3                 write circuitry to cause the probe to write the encoded data to the storage  
4 medium by forming at least the trenches in the storage medium.

1           18. The system of claim 17, wherein the encoding performed by the encoder  
2 causes each of the trenches to have greater than a predetermined length.

1           19. A method of storing data in a storage device, comprising:  
2                 forming, with a probe, a first structure in a storage medium, the storage  
3 medium further comprising a second structure;  
4                 indicating a first data state in response to detecting a transition between the  
5 first structure and the second structure in a first storage cell; and

6                   indicating a second data state in response to detecting lack of transition  
7                   between the first structure and the second structure in a second storage cell.

1                 20.       The method of claim 19, wherein the first structure comprises a trench, and the  
2                   second structure comprises a surface of the storage medium,

3                   wherein forming the trench comprises heating a temperature of a tip of the  
4                   probe to greater than a write temperature to cause a portion of the storage medium to melt.

1                 21.       The method of claim 20, wherein detecting a transition comprises detecting a  
2                   transition between the trench and the surface of the storage medium.

1                 22.       The method of claim 20, further comprising:  
2                   receiving input write data;  
3                   encoding the input write data to produce encoded write data; and  
4                   writing the encoded write data to storage cells of the storage medium instead  
5                   of the input write data,

6                   wherein writing the encoded write data to the storage cells comprises writing  
7                   variable length trenches in the storage medium.

1                 23.       A storage device comprising:  
2                   a probe;  
3                   a storage medium having a plurality of storage cells,  
4                   the probe to form plural variable-length trenches in the storage medium to  
5                   store data in the storage cells.

1                 24.       The storage device of claim 23, wherein the plural trenches comprise a first  
2                   trench and a second trench, the first trench having a first length, and the second trench having  
3                   a second, different length,  
4                   wherein the first trench extends through a first number of storage cells, and  
5                   wherein the second trench extends through a second, different number of storage cells.